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ABSTRACT

There is a tendency to equate electronic learning or e-learning with distance learning. In fact, e-learning covers a broad spectrum, from learning which is primarily contact based to learning which is 100% distance. Thus, each course can be measured by the proportion of learning and teaching that is intended to be conducted electronically. The principles of course design applied to the development of a given course should be influenced by the position of a course on this spectrum. Furthermore, there is a relationship between the proportion of e, the design strategy and the pedagogic model adopted by the designer. In this context didactic and constructivist models of learning are juxtaposed. The substantial recent development of web based learning has sparked renewed interest in constructivism and the way in which web based technology can facilitate engagement. While the relationship is not linear, this paper argues that the greater the proportion of e-learning used, the more developed the active learning components that are required. Finally, the development lifecycle adopted, and therefore the processes used in the development of the course and the software used for implementation of the course, will differ according to the proportion of e-learning anticipated. This argument is developed in the context of e-learning in higher education. Includes four figures. (Contains 21 references.) (Author)

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PROPORTION, PEDAGOGY AND PROCESSES: THE THREE P'S OF E-LEARNING

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ABSTRACT

There is a tendency to equate electronic learning or e-learning with distance learning. In fact, e-learning covers a broad spectrum, from learning which is primarily contact based to learning which is 100% distance. Thus, each course can be measured by the proportion of learning and teaching that is intended to be conducted electronically. The principles of course design applied to the development of a given course should be influenced by the position of a course on this spectrum. Furthermore, there is a relationship between the proportion of e, the design strategy and the pedagogic model adopted by the designer. In this context we juxtapose didactic and constructivist models of learning. The substantial recent development of web based learning has sparked renewed interest in constructivism and the way in which web based technology can facilitate engagement. Whilst the relationship is not linear, we argue that the greater the proportion of e-learning used, the more developed the active learning components that are required. Finally, the development lifecycle adopted, and therefore the processes used in the development of the course and the software used for implementation of the course, will differ according to the proportion of e-learning anticipated. This argument is developed in the context of e-learning in higher education.

INTRODUCTION

We can define e-learning simply as learning facilitated through electronic means. Research and development in e-learning in higher education has been well established for decades although the term e-learning is relatively new. In the 1980s and 1990s terms such as Computer Based Learning (CBL) and Courseware were widely used, yet fit the definition above. There has been a substantial increase in interest in higher education in e-learning since the establishment of the World Wide Web (Web) in 1991, and especially since the late 1990s as a result of the widespread adoption of the Web as a universal interface. Thus a contemporary definition of e-learning should probably include the use of the medium of the Web since this is how the term is now used colloquially.

At the same time we cannot ignore the use of other terms used in this context. The well established term online learning has to some extent been superseded by terms including virtual learning, web based learning, open learning, flexible learning, mixed mode learning and blended learning. Although these terms are well established their definitions are not. We use e-learning simply because it is probably the most widely used of a number of terms with similar meanings.

Today we are in the midst of a stampede to embrace e-learning with significant investment being made by Universities and other organisations throughout the world. Major alliances have been established, such as Universitas 21. Universities are both keen to defend and extend their empires. There has been a rush to place learning materials on the World Wide Web for fear of 'missing the boat.' Most Universities have appointed staff with titles including the terms used above. Since this initial rush, there has been a substantial body of opinion questioning the educational benefit of this development, subjecting e-learning to a level of scrutiny not experienced by more traditional means of dissemination of knowledge. Pedagogical quality has become the litmus test of e-learning and the quantity and calibre of interaction has become one of the main measures of this quality.

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WHAT PROPORTION OF E

It is valuable for the course designer or lecturer to decide upon the proportion of both the delivery of their course and the student learning experience that will be conducted by electronic means. This decision depends upon a great number of often conflicting issues including course objectives, stakeholder views and resources.

The great majority of higher education includes some use of electronic materials. This can range from the use of copies of electronically produced lecture notes, to the use of slides projected through computer equipment to entire courses on the World Wide Web. A simple horizontal rule can be used to indicate the proportion of the delivery of a course that is intended to be conducted electronically (Figure 1). Note that this line may be applied to either a measure of the proportion of electronic delivery or the proportion of the student learning experience: no distinction is drawn in this paper. By definition a course which includes e-learning may also fall anywhere on the line in Figure 1.

We can attempt to add to this scale different terms, whose use to some extent can be distinguished by their proportion of electronic delivery. We can call this a spectrum of e-learning.

Unlike the spectrum of light the scale in Figure 2 has no rigid scientific basis since terms such as flexible learning, open learning, online learning and distance learning tend to be used interchangeably and receive meaning only through their useage. For instance a course whose content is in the main delivered electronically may well be described as flexible learning. It is not the intention of this paper to provide a classification of these terms.

Whilst it is important for course developers to determine where their course falls on this scale, clearly in practice many courses evolve along the scale from left to right or right to left. Courses which are described as 'full time attendance' or contact teaching may include a substantial and growing element of distance learning by electronic means. Courses that are described as 'distance learning' may include the introduction of substantial face to face contact such as regional tutorials. The process of courses moving along the scale is gradually blurring the distinction between contact and distance learning.

SHOVELWARE

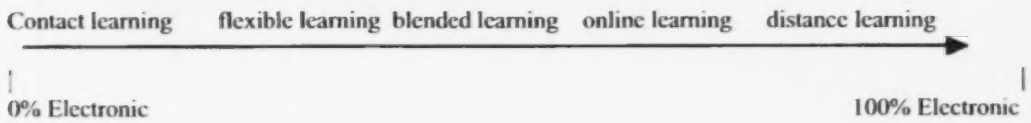
The use of electronic media is not new: the development of the World Wide Web (Web) has simply extended the range and functionality of facilities used. The Web has, however, made the development of e-learning much more widely available.

There has been a tendency amongst early adopters of Web based learning to use the Web as a simple huge repository for course materials such as lecture notes. Once such materials were placed on the Web it could be called e-learning and since the term was synonymous with distance learning, traditional means of teaching such as lectures and tutorials ceased to be required. Accountants rubbed their hands in glee until questions were raised concerning the pedagogical value of such education. This practice has became known as shovelware. Shovelware refers to "any content shoveled from one communication medium to another with little regard for the appearance, ease of use, or capabilities of the second medium" (Fraser 1999). There has rightly been a strong reaction to shovelware. Fraser argues "You may have shifted the nature of student access by moving to the Web, but access is not insight". There is substantial evidence that the students don't want it (Hara and Kling 2000), (Oliver and Omari 2001) and (Sheard et al 2000). There is also significant concern about the consequent commercialisation of higher education (Noble 1998).

FIGURE 1
PROPORTION OF DELIVERY BY ELECTRONIC MEANS

0% Electronic 100% Electronic

FIGURE 2
SPECTRUM OF E-LEARNING



In her paper 'Models of Online Courses' (1998) Robin Mason discusses how experience of using Web technology has shown course designers how learning is best encouraged and supported in the online environment. She uses the term 'Pedagogical Evolution' in this context. In consequence to this reaction there has been a scramble to adopt ideas concerning good pedagogical practice from the obvious source of knowledge; experts in distance education and those with experience in the development of CBL. In Britain as in other countries this has meant recourse to our specialist distance learning provider, The Open University. The fruits of this experience are now being applied to e-learning and may typically include the following ideas:

1. Since effective learning involves active learning, the pedagogical quality of e-learning materials can be simply measured by the quality of interaction involved.

2. Development of effective e-learning materials is extremely expensive and is best left to experts. One Figure oft quoted whose source is unclear is that 200 hours of development time are necessary for one hour of delivered e-learning material. The Open University once estimated that the development of a new course cost £1 million (Scott 2001).

3. As a result of 1 & 2 above, substantial planning, analysis and design is necessary before e-learning materials can be developed. By implication therefore a sequential lifecycle model is the most appropriate to the development of e-learning. (eg see Phil Race model used in 'course design for On-line learning' 1 day workshop at University of Salford 3/11/00 Figure 7. Also see Dick and Carey(1990)).

4. Off the shelf tools do not provide the level of complexity or customisability required and are therefore not suitable for the development of e-learning.

This pedagogical correctness is examined in the following sections.

THE PROPORTION OF INTERACTION

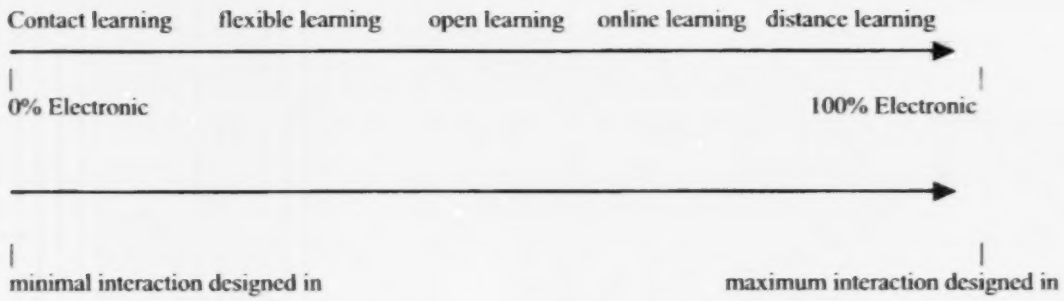
It is widely agreed that the level of engagement with and participation by students is a key metric in the quality assessment of higher education eg (QAA 2000 p. 41) and (SCOTT 2000). Designing interaction is rightly regarded as a vital part of the experience of higher education. It follows therefore that the greater the proportion of the learning objectives that are expected to be achieved by electronic means the greater the proportion of interaction that has to be designed into the e-learning materials. It can be argued that the converse is also true (see Figure 3).

ELECTRONIC LEARNING BY SPECIALISTS

It has been argued above that e-learning is not necessarily the same as distance learning. It follows that in some situations, where the delivery of courses whose delivery is in great part (eg >90%) electronic, the development work may best be left to specialist distance institutions. In the majority of situations the bulk of e-learning is lower on the spectrum and the main pedagogical issues may not be those involved in distance learning.

Distance learning clearly offers substantial advantages to the learner, for example in the area of accessibility, and therefore has a substantial market. One could argue that courses whose learning and teaching which is mainly required to be conducted by distance should be left to the specialist distance learning institutions. They have the necessary infrastructure such as departments for course design, reprographics, copyright, telephone helpline, on line libraries etc. The Web offers new

FIGURE 3



possibilities in terms of the media used in the delivery of such services.

However, in general what the materials of the dedicated distance learning institution gain in quality of production, they lose in flexibility. When a course involves investment of 200 hours of labour per hour of delivered material, substantial and restrictive version control procedures are necessary. Furthermore, changing distance learning materials is a significant problem when students may be enrolled on a course for many years. In fast changing academic areas, such as Information Systems, this creates a substantial and intrinsic problem for distance learning.

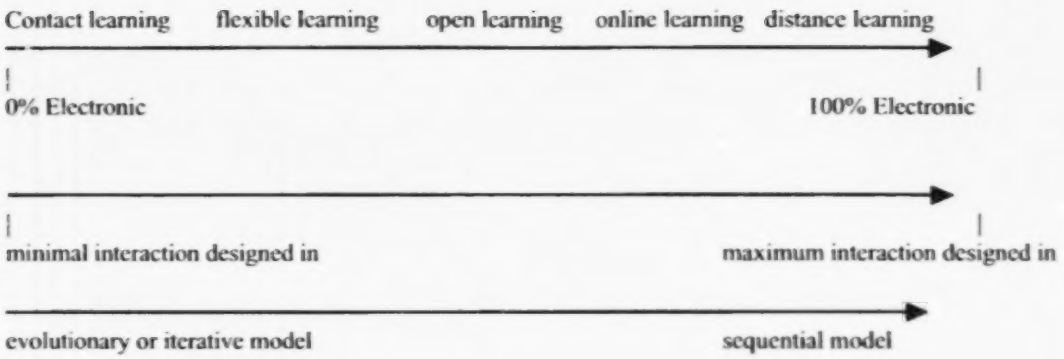
In this way institutions whose foundations are built upon contact teaching may usefully adopt an evolutionary life cycle approach for the development of e-learning materials.

LIFECYCLE MODEL TO BE USED

The debate concerning development lifecycles, established in the literature of software engineering eg (McConnell 1996), has been adopted into more general Project Management texts such as the Project Management Body of Knowledge (Project Management Institute 2000). There is significant debate concerning this issue in the context of web development - see (Scharl 2000) and (MacCormack 2001). One can juxtapose the sequential model of development known as the Waterfall model (Royce 1970) with the iterative model of development known as the Spiral model (Boehm 1988) and 1996). The evolutionary model put forward by (Scharl 2000) could be described as a close cousin of the spiral model. In the Waterfall model each stage of development follows each other sequentially until the final product is tested and released to the market. In the Spiral model, there is a substantial degree of user involvement and the product passes through a number of iterations before final release. In true evolutionary development there may be a number of planned releases, each one building upon the previous release. This is practised by a number of e-commerce organisations such as Expedia (ref. Computer). There has been much debate on the respective merits of different life cycle models (McConnell 1996), (Redmill 1997). In truth each is suited to different situations. Whilst the sequential model is the only practicable one for a major one off project such as a space mission to Mars which must be right first time, an Evolutionary or Spiral model may be much better suited to the development of a web site used for promotional purposes or for the purposes of supporting materials for a course that is primarily contact based.

In this context one could argue that the life cycle model to be adopted depends upon the proportion of the learning objectives that are to be achieved by distance. Whilst the sequential model is most suitable for a course that is designed to be delivered mainly by distance, the spiral model or evolutionary model is better suited to a course that is primarily contact based and is using electronic materials for support purposes. This is of course an important issue since the emphasis in the Waterfall model on getting the analysis and design right at first may actually obstruct the introduction of valuable support materials, where the adoption of a 'Just do it' philosophy may be more appropriate see Figure 4.

FIGURE 4



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